

Remarks

Further and favorable reconsideration is respectfully requested in view of the foregoing amendments and following remarks.

Claims 1-5 have been canceled. New claims 36-39 have been added to the application. New claim 36 corresponds to a combination of canceled claims 1 and 2. New claims 37, 38, 39 correspond to a combination of canceled claims 1 and 3, with each new claim drawn to one of the metals found in canceled claim 3.

The patentability of the present invention over the disclosures of the references relied upon by the Examiner in rejecting the claims will be apparent upon consideration of the following remarks.

Thus, the rejection of claims 1 and 4 under 35 U.S.C. §102(b) as being anticipated by Nakatani (JP 11-92971) has been rendered moot by the cancellation of these claims. Furthermore, the new claims specifically recite tantalum (claim 36), tungsten (claim 37), zirconium (claim 38) and hafnium (claim 39) as the masking material. Nakatani does not teach the use of tantalum, tungsten, zirconium, or hafnium as the masking material (as admitted by the Examiner at page 4, lines 4 and 5 of the Office Action). Therefore, Applicants assert that this rejection does not apply to the current claims.

The rejection of claims 2, 3 and 5 under 35 U.S.C. § 103(a) as being unpatentable over Nakatani in view of Xing et al. has been rendered moot by the cancellation of these claims. Furthermore, Applicants assert that this rejection does not apply to new claims 36-39, based upon the following remarks.

The Examiner acknowledges that Nakatani fails to teach the masking material wherein the metal is tantalum, tungsten, zirconium or hafnium, but asserts that Xing et al. teach examples of alternative hardmask materials including the following: Ti-N, Ta-N, Hf-N, Al-N, and alloys of the above with Ti-N, Ta-N, and W-N. The Examiner states that this teaching provides evidence that a masking material comprises tungsten, zirconium or hafnium and that a masking material comprising tantalum can be used as an alternative to the tungsten and hafnium hardmask materials of the claimed invention. The Examiner further asserts that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Nakatani by using Xing et al.'s Ta-N as an alternative hardmask material and tungsten or hafnium metals as masking materials for the purpose of using good hardmask material for particular difficult-to-etch materials.

However, the masking materials of Xing et al. are used in Ar/O₂, Cl₂/O₂ or Ar/O₂/Cl₂ gas plasma. There is no teaching in the reference that these masking materials can also be used with an etching gas of carbon monoxide and a nitrogenous compound (e.g. CO-NH₃ gas) as required in the present invention. [Note that all of new claims 36-39 require that the masking material is in contact with the etching gas.] For example, in chlorine gas, Al and poly-Si can be etched with a practical speed. However, in fluorine gas, Al cannot be etched with practical speed, while poly-Si can be etched with practical speed.

Therefore, simply because Ti-N, Ta-N, Hf-N, and W-N are suitable as masking materials for etching with a gas plasma of Ar/O₂, Cl₂/O₂ or Ar/O₂/Cl₂, does not mean they are suitable masking materials for etching with a mixed gas of carbon monoxide and a nitrogenous compound as in the present invention.


Furthermore, Applicants respectfully submit that this rejection is based on hindsight, which is improper according to U.S. practice. The Examiner has cited no evidence to support her conclusion that it would have been obvious to modify Nakatani by using Xing et al.'s masking materials. In the absence of such evidence, Applicants respectfully submit that, for this additional reason, the rejection based on Nakatani in view of Xing et al. is inappropriate. In re Zurko, 59 USPQ2d 1693.

For these reasons, Applicants take the position that the invention of claims 36-39 is clearly patentable over the references.

Therefore, in view of the foregoing amendments and remarks, it is submitted that each of the grounds of rejection set forth by the Examiner has been overcome, and that the application is in condition for allowance. Such allowance is solicited.

Respectfully submitted,

Isao NAKATANI et al.

By: 
Amy E. Pulliam
Registration No. 55,965
Agent for Applicants

MRD/AP/pth
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
May 21, 2004